

What is claimed is:

- 5           1.    A process for preparing a multilayer piezoelectric device with  
alternating piezoelectric ceramic layers and base metal layers as  
electrodes comprising the steps of:
- 10               (a)    applying onto a first layer, which includes a piezoelectric  
ceramic material and a first combination of organic  
materials, a second layer, which includes a base metal  
powder having particles, which are coated with material  
capable of protecting said base metal against oxidation, and a  
15               second combination of organic materials, to produce a first  
structure;
- 20               (b)    applying onto said first structure a second structure, which is  
identical to said first structure to produce a multilayer  
structure;
- 25               (c)    heating said multilayer structure at a temperature less than  
600°C to remove said first and second combinations of  
organic materials and their decomposition products such as  
carbon to levels below 200 ppm; thereafter
- 30               (d)    sintering at a temperature from about 600°C to about 1050°C  
at a partial pressure of oxygen from about  $10^{-3}$  to  $10^{-15}$  atm to  
produce said multilayer piezoelectric device with alternating  
piezoelectric ceramic layers and base metal layers as  
electrodes .

2. The method of claim 1, wherein said piezoelectric ceramic material is selected from the group consisting of PZT, PMN, bismuth-based piezoelectric materials, and lead-free ceramics based on  $\text{BaTiO}_3$ .
- 5 3. The method of claim 1, wherein said base metal is selected from the group consisting of Cu, Ni and alloys thereof.
4. The method of claim 1, wherein said first combination of organic materials includes binder, solvents, plasticizers, dispersants, and combinations thereof.
- 10 5. The method of claim 1, wherein said base metal coating to protect against oxidation is selected from the group consisting of glasses, metal oxides, organic material, noble metals, and combinations thereof.
- 15 6. The method of claim 1, wherein said second combination of organic materials includes solvents, binder, and combinations thereof.
7. The method of claim 1, wherein said heating is at a partial pressure of oxygen from about  $10^{-4}$  atm to ambient atm.
- 20 8. The method of claim 1, wherein said heating is at a temperature from about 25°C to about 500°C.
- 25 9. The method of claim 1, further including a cool-down step of said sintering at a partial pressure of oxygen below  $10^{-4}$  atm.
- 30 10. A multilayer piezoelectric device with alternating piezoelectric ceramic layers and base metal layers as electrodes prepared by the process of claim 1.

11. The device of claim 10, wherein said piezoelectric ceramic material is selected from the group consisting of PZT, PMN, bismuth-based piezoelectric materials, and lead-free ceramics based on  $\text{BaTiO}_3$ .
12. The device of claim 7, wherein said base metal is selected from the group consisting of Cu, Ni and alloys thereof.
13. The device of claim 7, wherein said first combination of organic materials includes binder, solvents, plasticizers, dispersants, and combinations thereof.
14. The device of claim 7, wherein said second combination of organic materials includes solvents, binder, and combinations thereof.